Use of 3D printing in teaching to bring together structure-activity relationships, drug design and public engagement with pharmacology

SJ Tucker

School of Medicine, Medical Sciences & Nutrition, University of Aberdeen

Background context

- The Pharmacology curriculum at the University of Aberdeen was aligned with the BPS core curriculum
- This identified some areas where we could develop a little more focus on key areas
- These were:
  - *Public engagement*
  - *Drug design*
  - *Structure-activity relationships*
  - *Molecular interactions*
- In response to this, an Honours year practical project was designed to help address and integrate these areas to develop emphasis and understanding

Aim

- To create an exercise drawing less emphasised strands of pharmacology together within the curriculum in Aberdeen with a view to better matching the BPS core curriculum

The 3D project

- Groups of 3 research into a known drug target
- With a chosen target, groups must research the 3D molecular structure and produce models for 3D printing
- Individuals also examine different drugs that influence the chosen target and prepare those files for printing
- Groups design a "new synthetic" for potential development and define the molecular structure and how it relates to the PK and PD of the drugs

Assessment 1:

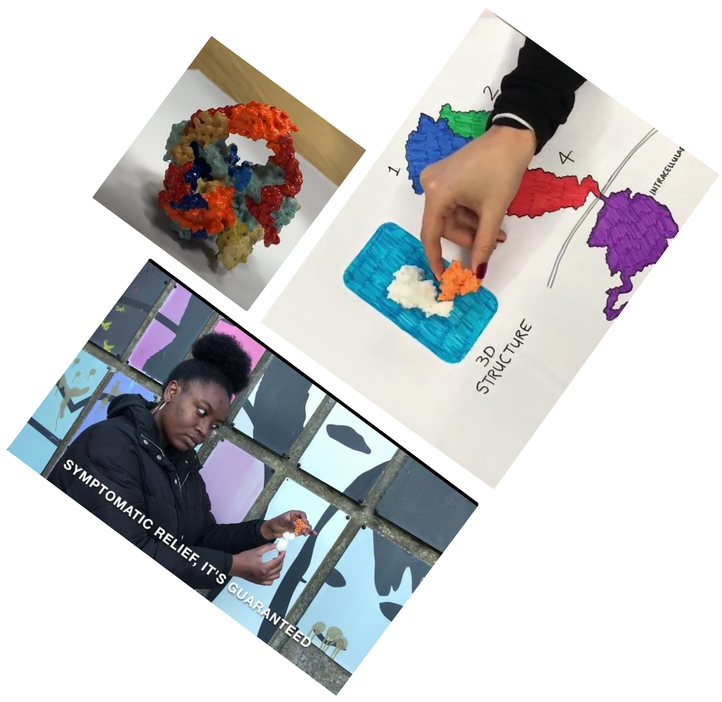
Lay person justification of target choice:

- *Individual* explanation of target
- Examples of drugs that interact
- Effects of interaction
- Pitched to public audience
- Public information
  - freedom of design
- Submitted examples:

Assessment 2:

Lay person public information video:

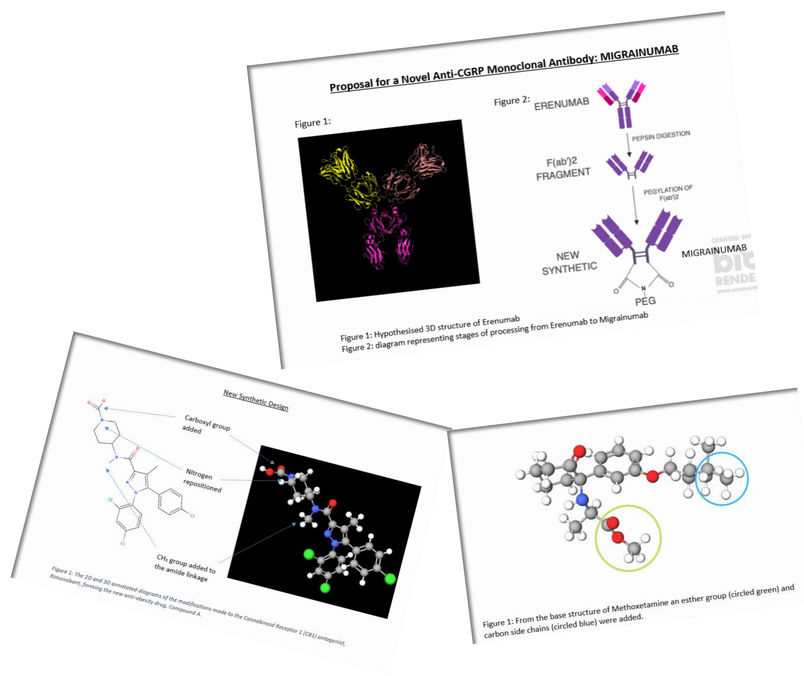
- *Group* video
- Use of 3D models
- Pitched to public audience
- 4 min maximum
- Staff and peer marked
- Video screenshots:



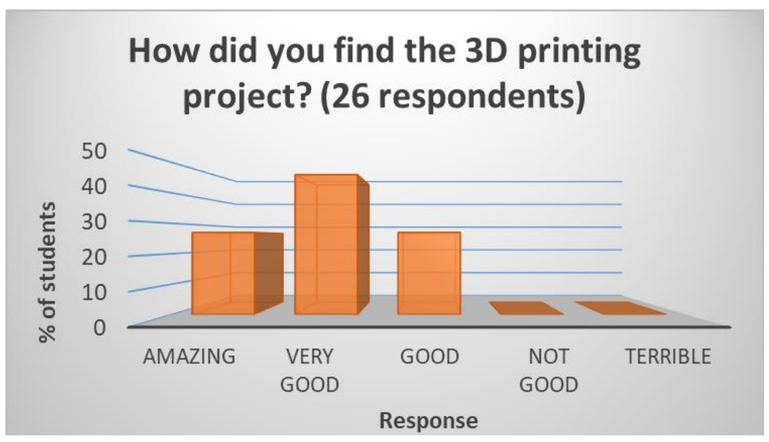
Assessment 3:

Design of new synthetic drug for target:

- *Group* design
- Use of 3D molecular software
- Design to be annotated to indicate new structural moieties
- 300 word narrative explaining the new PK and PD profile
- Example new synthetics:



Evaluation



- "enjoyed combination of group and individual exercises, and the variety of assessments"
- "fun and informative"
- "made me think about how to approach explaining complex concepts to the public"
- "unique and enjoyable experience"
- "good experience of 3D molecular interactions and drug design"

Outcomes

- Development of 3D understanding, drug design and molecular modelling
- Visual, tangible and interactive approach
- In-depth research into a specific target and drug
- Focus on public engagement and produces materials for Outreach
- Variety of assessments involving different media assesses variety of skills
- Combination of group and individual tasks